B4 contd. setting means in accordance with the measured progressions of the spring forces are provided.

REMARKS:

1) Examination of the present U. S. National Phase Application is to proceed on the basis of claims 1 to 3 and 7 to 10. Claims 8, 9 and 10 are directly based on the translated PCT International Application claims 4, 5 and 6, except for omitting multiple dependencies.

2) A few typographical errors (e.g. in reference numbers) that existed in the PCT International Application text and the literal English translation thereof have been corrected in the present amendment of the specification. A marked-up version of the amended pages of the specification is enclosed to show the amendatory subject matter. No new matter has been introduced. Any further informalities of the literally translated specification and claims will be addressed after receiving the first Office Action.

3) It is noted that the International Preliminary Examination Report indicates that at least claims 5 to 7 (i.e. present claims 9, 10 and 7) satisfy all criteria for patentability under the PCT.

4) Favorable consideration and allowance of claims 1 to 3 and 7 to 10 are respectfully requested.

Respectfully submitted,

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stroke travel that is limited by the electromagnets 2, 3. A spring arrangement with a first spring 61 acting in the opening direction onto the armature 1 and a second spring 62 acting in the closing direction onto the armature 1 effectuates that the armature 1 is held in a neutral equilibrium position between the electromagnets 2, 3 in the de-energized condition of the exciting coils 20, 30. Furthermore, adjusting or setting means 71, 72 for setting the pre-stressing of the springs 61, 62 are provided. The setting means 71, 72 may, for example, be embodied as disks, which effectuate a compression of the springs 61, 62 $\boxed{71, 72}$, and thereby prescribe the pre-stressing of the respective springs 61, 62 $\boxed{71, 72}$. They may, however, also be controllably embodied, and enable a stepless variation of the pre-stressing.

For starting the actuator, one of the electromagnets 2, 3 is energized, that is to say switched on, by applying an exciting voltage to the corresponding exciting coil 20 or 30, or a transient start-up oscillation routine is initiated, by means of which the armature 1 is first set into oscillation by alternating energization of the electromagnets 2, 3, in order to strike against the pole surface of the closing magnet 2 or the pole surface of the opening magnet 3 after a start-up oscillation transient time.

With a closed gas exchange valve 5, the armature 1 lies against the pole surface of the closing magnet 3 as shown in Fig. 1, and it is held in this position - the upper end position - as long as the closing magnet 3 is energized. In order to open the gas exchange valve 5, the closing magnet 3 is switched off, and next

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a maximum value F13, which is achieved at the armature position Ix, in order to thereafter fall off to an end value F10 lying below the holding value F11, whereby the end value F10 is achieved at the armature position Im, that is to say in connection with the armature 1 lying against the opening magnet 2. In contrast, the spring force of the second spring 62 increases from an end value F20, which is effective in the in the upper end position of the armature 1, monotonously but non-linearly to a holding value F21, which is achieved in the lower end position of the armature 1. The end values F10, F20 give the pre-stressing of the respective spring 61 or 62; they are adjusted or set in such a manner so that the area A1 under the spring characteristic curve F1 is equal to the area A2 under the spring characteristic curve F2. The areas A1 and A2 in that context correspond to the energy that is stored in the respective spring 61, 62, if these are compressed due to the motion of the armature. The two spring characteristic curves F1, F2 61, 62 intersect each other at a point that prescribes the energetic center position Ie of the armature 1; this energetic center position Ie, which the armature 1 takes up with de-energized electromagnets 2, 3, generally does not correspond with the geometric center position between the electromagnets 2, 3 in connection with springs with different spring characteristic curves.

On the one hand, the substantial advantage of the first spring 61, due to the maximum value F13 of its spring characteristic curve F1, is that it is in the position to store so much energy, that the armature 1 will be moved with high velocity during the de-stressing of the first spring 61, which leads to short switch-

corresponding to the stroke travel distance Im of the armature 1, and the progression of the spring force, which results thereby, is measured section-wise and integrated section-wise over the spring travel distance. The result of this integration corresponds to the energy that is stored in this context in the second spring 62. Thereby, the measurement of the spring force can be carried out by means of a load cell or a measuring gage.

The energy that is stored in the first spring 61 if the armature 1 is moved from its lower end position to its upper end position, is also measured in the same manner as described above, namely by measuring the progression of the spring force of the first spring 61 that results from the armature motion, and by integration of this progression over the spring travel distance, through which the first spring 61 is thereby compressed. Next, the energy values that have been determined in this manner are compared with one another, and the pre-stressing of the first spring 61 is adjustingly set in such a manner so that the same energy is stored in the two springs 61, 62 $\boxed{61}$, if these are compressed by the stroke travel distance Im. The actuator is only installed into the internal combustion machine after this adjustment.

In the present example embodiment, the actuator is adjusted before placing it into operation. Also conceivable, however, are an adjustment during the operation, and an after-adjustment dependent on operating parameters. In this case, the adjusting or setting means are controllably embodied, and the progressions of the spring forces are measured with measuring means, onto which the springs act, for example with pressure sensors, espe-

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